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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/649,315	08/27/2003	Balvinder Singh	7416/89890	5402
24628	7590	06/15/2007		
WELSH & KATZ, LTD 120 S RIVERSIDE PLAZA 22ND FLOOR CHICAGO, IL 60606			EXAMINER GREY, CHRISTOPHER P	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/649,315	Applicant(s) SINGH ET AL.	
	Examiner Christopher P. Grey	Art Unit 2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 August 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-33 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-6 and 10-33 is/are rejected.
- 7) ☒ Claim(s) 7-9 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1, 2, 17, 18, 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mazzino (US 20040151110) in view of the applicants admitted prior art.

Claim 1, 17 Mazzino discloses an inverse fast Fourier transform circuit having a length of N coefficients (**see fig 3, coefficients 1-N**), the inverse fast Fourier transform circuit adapted to receive input data of length N coefficients and generate output data of length N coefficients (**see input and output of IFFT in fig 3**) that are circularly shifted by m coefficients (**para 0037, circular shifting by tau samples and para 0033 shifting coefficients; circular shifting**).

Mazzino does not specifically a cyclical prefix insertion circuit adapted to insert a cyclical prefix of length m, the cyclical prefix insertion circuit having;

1. a first switch connected to the inverse fast Fourier transform circuit.
2. a buffer having an input connected to the first switch and an output, the buffer having a length m.

3. a second coupled to the first switch and to the buffer, wherein the first and second switches selectively couple the output of the buffer and the inverse fast Fourier transform circuit to an output of the second switch.

The applicants admitted prior art discloses a cyclical prefix insertion circuit adapted to insert a cyclical prefix of length m (**page 7, para 0037 and see fig 3, GI represents guard interval and para 0036 discloses a length of 16**), the cyclical prefix insertion circuit having;

1. a first switch (fig 3, 126), connected to the inverse fast Fourier transform circuit (**fig 3, IFFT output**).

2. a buffer (fig 3, 128), having an input connected to the first switch (**fig 3, 126**) and an output, the buffer having a length m (**para 0036 discloses length of 16**).

3. a second switch (**fig 3, 130**), coupled to the first switch and to the buffer, wherein the first and second switches selectively couple the output of the buffer and the inverse fast Fourier transform circuit to an output of the second switch (**see fig 3 for details**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the switches as disclosed by fig 3 of the admitted prior art within the circuit provided in fig 4, 20 of Mazzino. The motivation for this combination is to selectively route the output of the IFFT.

Claim 2, 18, 23 Mazzino discloses wherein N coefficients are modified by a multiplier coupled to the IFFT circuit, the multiplier adapted to receive the input data and

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provide the product of the input data and $e^{-(j2\pi k m/N)}$ to the IFFT circuit (**fig 4, 22 and $e^{(jKi\tau)}$**).

Claim 21 Mazzino discloses wherein the cyclical prefix comprises a guard interval for an ofdm system (**see title and para 0003, ADSL and DMT modulation**).

Claim 22 Mazzino discloses (a) performing a circularly rotated IFFT on frequency domain information to generate time domain information, wherein the amount of the circular shift is the same as the length of the cyclical prefix (**para 0031, circular shifting samples of a symbol so that the last samples forming the symbol before shifting form the prefix**).

(b) storing the time domain for a number of clock cycles equal to the cyclical prefix in a buffer (para 0037, samples stored in memory in fig 3, 24) while simultaneously outputting the time domain information (**para 0038, provides first sample; store the samples generated by IFFT**).

(d) outputting the time domain information stored in the buffer for a number of clock cycles equal to the length of the cyclical prefix (**para 0040, where memory is controlled in the read mode at a time**).

Mazzino does not specifically disclose (c) outputting the time domain information for a number of clock cycles equal to a length of the IFFT minus the length of the cyclical prefix.

The applicants admitted prior art discloses (c) outputting the time domain information for a number of clock cycles equal to a length of the IFFT minus the length

of the cyclical prefix (**para 0037, the samples 0 to 63 will then be read out of the buffer**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the invention of Mazzino to output the time domain information for a number of clock cycles equal to a length of the IFFT minus the length of the cyclical prefix. The motivation for this modification is for continuous output.

2. Claims 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mazzino (US 20040151110) in view of the applicants admitted prior art, in further view of Walton et al. (US 20040081131), hereinafter referred to as Walton.

Claim 3 The combined teachings of Mazzino and the applicants admitted prior art does not specifically disclose wherein the length of N coefficients is a power of 2 and wherein the IFFT circuit implements an algorithm selected from the group consisting of Radix-2 and Radix 2^2 algorithms.

Walton discloses wherein the length of N coefficients is a power of 2 and wherein the IFFT circuit implements an algorithm selected from the group consisting of Radix-2 and Radix 2^2 algorithms (**para 0044 and para 0042 where $N_{max} = 2^S$**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the IFFT unit as disclosed by the combined teachings of Mazzino and the applicants admitted prior art to employ a decimation in time or decimation in

frequency IFFT algorithm (para 0044). The motivation for this modification is to allow IFFT of different sizes to be performed using a single IFFT unit.

Claim 10, 11 Mazzino does not specifically disclose wherein the length of N coefficients of the IFFT is equal to 64 and the cyclical prefix has a length m equal to 16 (**para 0037**), and the modification is applied to control for the first rotator circuit of the IFFT circuit to circularly shift the output data by 16 coefficients (**para 0037, the 16 last samples are buffered and output first, hence are circularly shifted**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the switches as disclosed by fig 3 of the admitted prior art within the circuit provided in fig 4, 20 of Mazzino. The motivation for this combination is to selectively route the output of the IFFT.

3. Claims 4,5,6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mazzino (US 20040151110) in view of the applicants admitted prior art, in further view of Walton et al. (US 20040081131), hereinafter referred to as Walton in further view of Yeh (US 2004/0059766).

Claim 4, 5, 6 The combined teachings of Mazzino and the applicants admitted prior art does not specifically disclose wherein the IFFT circuit further comprises a plurality of butterfly circuits, multiplier circuits with memory and rotator circuits, all coupled to a control circuit and wherein the N coefficients are modifies by modifying the control for the first rotator circuit and memory contents of the first multiplier circuit with memory. The combined teachings also do not disclose each butterfly circuit being configured to perform an addition and subtraction operation (claim 6).

Walton discloses a plurality of butterfly circuits.

The combined teachings of Mazzino, the applicants admitted prior art and Walton do not specifically disclose multiplier circuits with memory and rotator circuits, all coupled to a control circuit and wherein the N coefficients are modified by modifying the control for the first rotator circuit and memory contents of the first multiplier circuit with memory. The combined teachings also do not disclose each butterfly circuit being configured to perform an addition and subtraction operation (claim 6).

Yeh discloses multiplier circuits (**fig 3, 38**) with memory and rotator circuits (**para 0058**), all coupled to a control circuit (fig 3, 36) and wherein the N coefficients are modified by modifying (**see para 0057, for W'n where the variable n is modifiable**) the control for the first rotator circuit and memory contents of the first multiplier circuit with memory (**para 0059, wherein Yeh discloses the control unit providing an appropriate coefficient to the multiplier. Furthermore, some form of memory is inherently necessary to store the given coefficients**).

Pertaining to claim 6, Yeh discloses each butterfly circuit being configured to perform an addition and subtraction operation (para 0056).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Mazzino, the applicants admitted prior art and Walton to employ the IFFT circuitry as disclosed by Yeh. The motivation for this modification is to perform an alternative means of IFFT processing.

4. Claims 19, 20, 24, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mazzino (US 20040151110) in view of the applicants admitted prior art in further view of Yeh (US 2004/0059766).

Claim 19, 24 The combined teachings of Mazzino and the applicants admitted prior art does not specifically disclose wherein the means for performing a circularly rotated IFFT further comprises a means for modifying **(see para 0057, for W^n where the variable n is modifiable)** the control for the first rotator circuit and memory contents of the first multiplier circuit **(fig 3, 38)** with memory **(para 0059, wherein Yeh discloses the control unit providing an appropriate coefficient to the multiplier. Furthermore, some form of memory is inherently necessary to store the given coefficients).**

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Mazzino, the applicants admitted prior art and Walton to employ the IFFT circuitry as disclosed by Yeh. The motivation for this modification is to perform an alternative means of IFFT processing.

Claim 20, 25 The combined teachings of Mazzino and the applicants admitted prior art does not specifically disclose wherein the means for performing a circularly rotated IFFT further comprises a means for modifying **(see para 0057, for W^n where the variable n is modifiable)** the order of the contents of the memory and modifying the control circuit to modify the control **(para 0059, wherein Yeh discloses the control unit providing an appropriate coefficient to the multiplier. Furthermore, some form of memory is inherently necessary to store the given coefficients)** of the rotator circuits **(para 0058)** and butterfly circuits **(fig 3, 31-33).**

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the combined teachings of Mazzino, the applicants admitted prior art and Walton to employ the IFFT circuitry as disclosed by Yeh. The motivation for this modification is to perform an alternative means of IFFT processing.

5. Claims 26-33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh (US 2004/0059766) in view of Mazzino (US 20040151110)

Claim 26, 30 Yeh discloses a transform circuit wherein the length of N coefficients is a power of 2 (**para 0052, $N=2^n$**) and wherein the IFFT circuit implements an algorithm selected from the group consisting of Radix-2 and Radix 2^2 algorithms (**para 0032, where Radix 2 is used as the base for the algorithm being used**).

Mazzino discloses the transform circuit further having a plurality of butterfly circuits (**fig 3, 31-33**), multiplier circuits (**fig 3, 38**) with memory and rotator circuits (**para 0058**), all coupled to a control circuit (**fig 3, 36**), wherein an output of the transform circuit is modifying the control to a first stage rotator circuit and modifying the memory contents of the multiplier circuit, where m is less than N (**para 0071**).

Yeh does not specifically disclose circularly shifting by m coefficients.

Mazzino discloses circularly shifting by m coefficients (**para 0031, where the circular shifting occurs on designated prefix samples**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the teachings of Yeh to employ circuitry for inserting a prefix, where circular rotation is necessary. The motivation for this is to insert a guard interval.

Claim 27, 28, 29, 31, 32, 33

Yeh discloses wherein the transform circuit is configurable as an inverse fast Fourier transform circuit and as a FFT circuit (**para 0010**), wherein each configuration maintains the same circular shift of m coefficients (**para 0030, change of mathematical coefficients...**)

6. Claims 13-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yeh (US 2004/0059766) in view of Mazzino (US 20040151110) in further view of the applicants admitted prior art

Claim 13, 14, 15

Yeh discloses a transform circuit wherein the length of N coefficients is a power of 2 (**para 0052, $N=2^n$**) and wherein the IFFT circuit implements an algorithm selected from the group consisting of Radix-2 and Radix 2^2 algorithms (**para 0032, where Radix 2 is used as the base for the algorithm being used**).

Yeh discloses the transform circuit further having a plurality of butterfly circuits (**fig 3, 31-33**), multiplier circuits (**fig 3, 38**) with memory and rotator circuits (**para 0058**), all coupled to a control circuit (**fig 3, 36**), wherein an output of the transform circuit is modifying the control to a first stage rotator circuit and modifying the memory contents of the multiplier circuit, where m is less than N (**para 0071**).

Yeh does not specifically disclose circularly shifting by m coefficients.

Mazzino discloses circularly shifting by m coefficients (**para 0031, where the circular shifting occurs on designated prefix samples**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to modify the teachings of Yeh to employ circuitry for inserting a prefix, where circular rotation is necessary. The motivation for this is to insert a guard interval.

The combined teachings of Yeh and Mazzino do not specifically a cyclical prefix insertion circuit adapted to insert a cyclical prefix of length m , the cyclical prefix insertion circuit having;

1. a first switch connected to the inverse fast Fourier transform circuit.
2. a buffer having an input connected to the first switch and an output, the buffer having a length m .
3. a second coupled to the first switch and to the buffer, wherein the first and second switches selectively couple the output of the buffer and the inverse fast Fourier transform circuit to an output of the second switch.

The applicants admitted prior art discloses a cyclical prefix insertion circuit adapted to insert a cyclical prefix of length m (**page 7, para 0037 and see fig 3, GI represents guard interval and para 0036 discloses a length of 16**), the cyclical prefix insertion circuit having;

1. a first switch (fig 3, 126), connected to the inverse fast Fourier transform circuit (**fig 3, IFFT output**).
2. a buffer (fig 3, 128), having an input connected to the first switch (**fig 3, 126**) and an output, the buffer having a length m (**para 0036 discloses length of 16**).

3. a second switch (**fig 3, 130**), coupled to the first switch and to the buffer, wherein the first and second switches selectively couple the output of the buffer and the inverse fast Fourier transform circuit to an output of the second switch (**see fig 3 for details**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the switches as disclosed by fig 3 of the admitted prior art within the circuit provided in fig 4, 20 of Mazzino. The motivation for this combination is to selectively route the output of the IFFT.

Claim 16 The combined teachings of Yeh and Mazzino do not specifically disclose wherein the length of N coefficients of the IFFT is equal to 64 and the cyclical prefix has a length m equal to 16 (**para 0037**), and the modification is applied to control for the first rotator circuit of the IFFT circuit to circularly shift the output data by 16 coefficients (**para 0037, the 16 last samples are buffered and output first, hence are circularly shifted**).

It would have been obvious to one of the ordinary skill in the art at the time of the invention to combine the switches as disclosed by fig 3 of the admitted prior art within the circuit provided in fig 4, 20 of Mazzino. The motivation for this combination is to selectively route the output of the IFFT.

Allowable Subject Matter

7. Claims 7-9 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

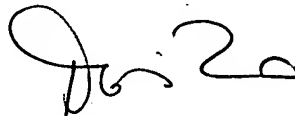
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher P. Grey whose telephone number is (571)272-3160. The examiner can normally be reached on 10AM-7:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Doris To can be reached on (571)272-7629. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher Grey
Examiner
Art Unit 2616

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7/1/07


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